CLAIMS

What is claimed is:

5          1.    A method for updating an earth model
comprising the steps of:
              obtaining an earth model used for predicting
          potential problems in drilling of a borehole
          having a predetermined trajectory, the earth model
10        comprising a plurality of components;
              obtaining evaluations of the state of the
          borehole and local geological features, the
          evaluations being based on the earth model;
              receiving data gathered during the
15        construction of the borehole;
              comparing the evaluations with a diagnosis of
          the state of the borehole and local geological
          features to identify at least one inconsistency,
          the diagnosis being based on the received data;
20            selecting a component of the earth model that
          is related to the identified inconsistency and has
          a high degree of uncertainty; and
              updating the selected component of the earth
          model prior to completing construction of the
25        borehole using the received data.


          2.    The method of claim 1 wherein the
evaluations of the state of the borehole and local
30    geological features include predictions of one or more
conditions under which the borehole will fail.

3.    The method of claim 2 wherein the predictions are obtained by combining the earth model with the predetermined trajectory of the borehole.

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4.    The method of claim 3 further comprising repeating the steps of combining, comparing, selecting and updating until a sufficient match exists between the predicted failure conditions and the diagnoses of

10    the borehole.

5.    The method of claim 4 wherein the step of combining when repeated uses the updated component of the earth model, and the step of selecting when

15    being repeated, considers components that have been recently updated as having a lower degree of uncertainty.

6.    The method of claim 1 wherein the step

20    of selecting a component comprises:
          identifying components of the earth model
     that are relevant to the identified inconsistency;
     and
          ranking the identified components according

25        to the degree of uncertainty.

7.    The method of claim 1 wherein the selected component is the component having the highest degree of uncertainty of the components that are

30    related to the identified inconsistency.

8.     The method of claim 1 wherein the step of updating comprises effecting the minimum practical changes to the selected component that eliminates an identified inconsistency.

9.     The method of claim 1 wherein the received data includes the effective density of the drilling fluid used in the construction of the borehole and one at least other parameter, and the step of updating comprises updating the selected component using the effective density and the at least one other parameter.

10.     The method of claim 1 wherein the diagnosis of the borehole is generated by extensive use of real-time MWD and LWD measurements.

11.     The method of claim 1 wherein the step of obtaining an earth model includes generating the earth model.

12.     A method for drilling a borehole using an earth model comprising the steps of:
        obtaining an earth model used for predicting potential problems in drilling of a borehole having a predetermined trajectory comprising a plurality of components;
        predicting one or more conditions under which the borehole will fail based on the earth model and the predetermined trajectory;

drilling part of the borehole substantially
according to the predetermined trajectory;

receiving data gathered during the
construction of the borehole;

5        comparing the predicted failure conditions
with a diagnoses of the borehole based on the
received data to identify at least one
inconsistency;

selecting a component of the earth model that
10       is related to the identified inconsistency and has
a high degree of uncertainty;

updating the selected component of the earth
model prior to completion of the borehole using
the received data; and

15       thereafter drilling a further portion of the
borehole using the earth model including the
updated component.

13.  The method of claim 12 further
20  comprising repeating the steps of predicting,
comparing, selecting and updating until a sufficient
match exists between the predicted failure conditions
and the diagnoses of the borehole.

25        14.  The method of claim 13 wherein the step
of combining when repeated uses the updated component
of the earth model, and the step of selecting when
being repeated, considers components that have been
recently updated as having a lower degree of
30  uncertainty.

15.  The method of claim 12 wherein the step
of selecting a component comprises:

        identifying components of the earth model
    that are relevant to the identified inconsistency;
5   and

        ranking the identified components according
    to the degree of uncertainty.


16.  The method of claim 12 wherein the step
10  of updating comprises effecting the minimum practical
changes to the selected component that eliminates an
identified inconsistency.


17.  The method of claim 12 wherein the
15  received data includes the effective density of the
drilling fluid used in the construction of the borehole
and one at least other parameter, and the step of
updating comprises updating the selected component
using the effective density and the at least one other
20  parameter.


18.  A computer readable medium that is
capable of causing a computer to perform steps
comprising:
25          obtaining an earth model used for predicting
        potential problems in drilling of a borehole
        having a predetermined trajectory, the earth model
        comprising a number of components;
            obtaining evaluations of the state of the
30      borehole and local geological features, the
        evaluations being based on the earth model;

receiving data gathered during the

construction of the borehole;

comparing the evaluations with a diagnosis of

the state of the borehole and local geological

5          features to identify at least one inconsistency,

the diagnosis being based on the received data;

selecting a component of the earth model that

is related to the identified inconsistency and has

a high degree of uncertainty; and

10          updating the selected component of the earth

model prior to completing construction of the

borehole using the received data.


19.   The computer readable medium of claim 18

15   capable of causing a computer to perform steps further

comprising:

identifying components of the earth model

that are relevant to the identified inconsistency;

and

20          ranking the identified components according

to the degree of uncertainty.


20.   The computer readable medium of claim 19

wherein the step of updating comprises effecting the

25   minimum practical changes to the selected component

that eliminates an identified inconsistency.


21.   The computer readable medium of claim 20

wherein the received data includes the effective

30   density of the drilling fluid used in the construction

of the borehole and one at least other parameter, and

the step of updating comprises updating the selected
component using the effective density and the at least
one other parameter.

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